

**Briefing Paper on Key Issues and Potential Action Items
for a National Agenda to Improve Intersection Safety**

Transportation Research Board Committee A3A08 – Operational Effects of Geometrics

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September 15, 2001

Introduction and Background

The Transportation Research Board Committee on the Operational Effects of Geometrics supports, promotes, and disseminates information and innovations related to the operation and safety impacts of changes in roadway and intersection geometry. Changes to a roadway or intersection environment, whether physical or operational, also have an impact on road user safety. Members of the Committee are directly involved with the implementation of changes to the roadway or intersection environment, and/or an evaluation of their subsequent operational and safety impacts.

Key Issues

Members of the Operational Effects of Geometrics Committee believe the following subject areas and issues should be discussed for the complete consideration of intersection safety in the United States. It is recommended that the following items be evaluated and assessed during the development of a national agenda on intersection safety improvements:

- The lack of a generally accepted screening methodology for the selection of intersections which show a promise for improvement. There are a number of methods that have been used to identify and/or rank “high” crash intersection locations. It has been proposed that it would be more rational to consider only those intersections that can reasonably be improved.
- The lack of intersection inventory files at agencies (including historical data). The efficient management of safety at intersections requires the consideration of data on intersection geometrics, traffic control, and traffic volumes. Such data are not typically available to analysts in electronic format. In particular, rational systemwide safety management for intersections should be based on reliable estimates of intersection traffic volumes on both major- and minor-road approaches.
- Signalization of rural intersections. A number of devices are used in an attempt to improve the safety of rural intersections (signalized/unsignalized and divided/undivided roadways). For example, the signalization of an intersection between a high-speed divided roadway (i.e., expressways) and a two-lane rural roadway can produce safety concerns. There are numbers of devices and/or traffic control approaches used to mitigate these safety concerns (e.g., advance warning systems, driver information methodologies, and long distance detectors). The safety impacts of dilemma zones and the use of detectors on high-speed approaches should be considered
- Signalization of urban intersections. Urban intersections have safety concerns that should be considered. Safety can be impacted by the distance between consecutive signalized intersections, the use (or lack) of protected or protected/permitted left-turn and/or pedestrian exclusive phases, and synchronization, coordination, and progression. Pedestrians and bicycles should be a particular focus for safety at urban intersections.
- The safety impact of right-turn-on-red vehicles at intersections (i.e., pedestrian/vehicular collisions, angle and side-swipe opposite direction vehicular collisions, and rear-end same direction vehicular collisions).
- The importance of sight distance at intersections and, particularly, the use of offset left- and right-turn lanes so that vehicles are not positioned to block the view of other drivers.

- The safety impacts of channelization. Discuss full-width right-turn lanes (or slip lanes) and their suitability for corridors where there is a pedestrian presence. Also consider the safety impacts of turning when there is no dedicated turn lane, the length of the turn lane, and the ability of vehicles to properly merge/diverge.
- The relationship of approach speeds to intersection safety. A better understanding of effective methods to influence intersection approach speeds as part of a safety improvement strategy is needed.
- The effectiveness of innovative and unconventional intersection configurations and phasing. A number of approaches exist that can be used to minimize conflicts at intersections, but still allow access. This could and should include the use of roundabouts, median u-turn treatments, continuous flow intersections, and jughandles. In particular, the safety of multiple-lane roundabouts should be discussed.
- The effectiveness of red-light-running cameras in improving safety, and the need for guidelines on their effective use. Research is ongoing about how, when, and where red-light-running automated enforcement equipment should be and can be used effectively.
- The overall safety impacts of replacing an at-grade intersection with a grade-separated interchange. What are the safety implications of making a change of this type?
- The overall safety impacts of signalizing intersections that are currently unsignalized and the effectiveness of alternative treatments that do not include signalization.
- The safety impacts of the following treatments at rural/urban intersections: lighting, rumble strips, double left-turn permitted movements, pedestrian push button and ramp design, island size and type, midblock signals/crosswalks, blind or hearing impaired pedestrians, bike lanes, markings for pedestrian crossings, temporarily obstructed sight distance corners and signals (e.g., due to vegetation and trucks, respectively), young/old drivers, LED heads, and signal visibility and location.

Action Items/Next Steps

- Several of the items in the previous section will require additional research to properly determine the impacts of the characteristics or designs identified. The individual and cumulative safety impacts of different characteristics at the same location require careful consideration, and are necessary for the development of credible and useful safety analysis tools.
- The devices, programs, and information systems mentioned in the previous list should be developed and implemented if determined to be appropriate, and their usefulness and impact(s) on the operation and safety of intersections. For example, additional research is needed on the effectiveness of advance warning lights on high-speed approaches, warning systems, driver information methodologies, the use of long-distance actuation, and the impact and determination of dilemma zones.
- There are a number of initiatives that will help define and address the issue of intersection safety. These initiatives include, but are not limited to the development of a Highway Safety Manual, the Interactive Highway Safety Design Model, and the

Comprehensive Highway Safety Model. Discussion, use, and continued support of these tools is recommended along with the implementation of research they identify as necessary to improve intersection safety.

- Continued and improved education and training of drivers and transportation professionals in the areas of proper driving techniques and the analysis and determination of safety concerns, respectively.
- There is a need to develop a better understanding of the potential effectiveness of enforcement actions at intersections (including the use of new technology) and to provide that information both to enforcement and engineering personnel with responsibility for intersection safety.